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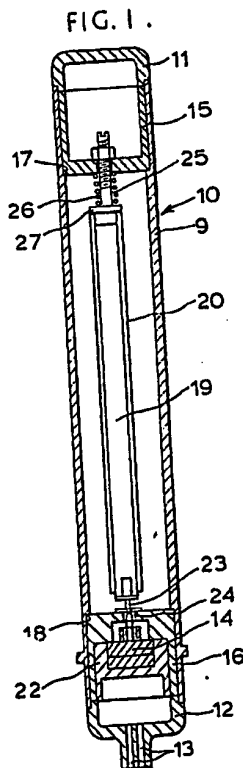
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GB 1100717 GB 0413584
GB 0465895 GB 0412139

(58) Field of search
G1S

(54) Humidity sensor

(57) A humidity sensor comprises an elongate wooden sensing element (19) in which the grain extends transverse to the longitudinal extent of the sensing element. The element changes length in response to humidity variations and is surrounded by an air permeable reinforcing member (20) (to prevent bending and breakage of the element) mounted in a perforated housing (10). A switch (14) is operable in response to longitudinal expansion or contraction of the sensing element to activate an alarm, eg to warn of excessive humidity in an enclosure containing electronic equipment.



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FIG. 1.

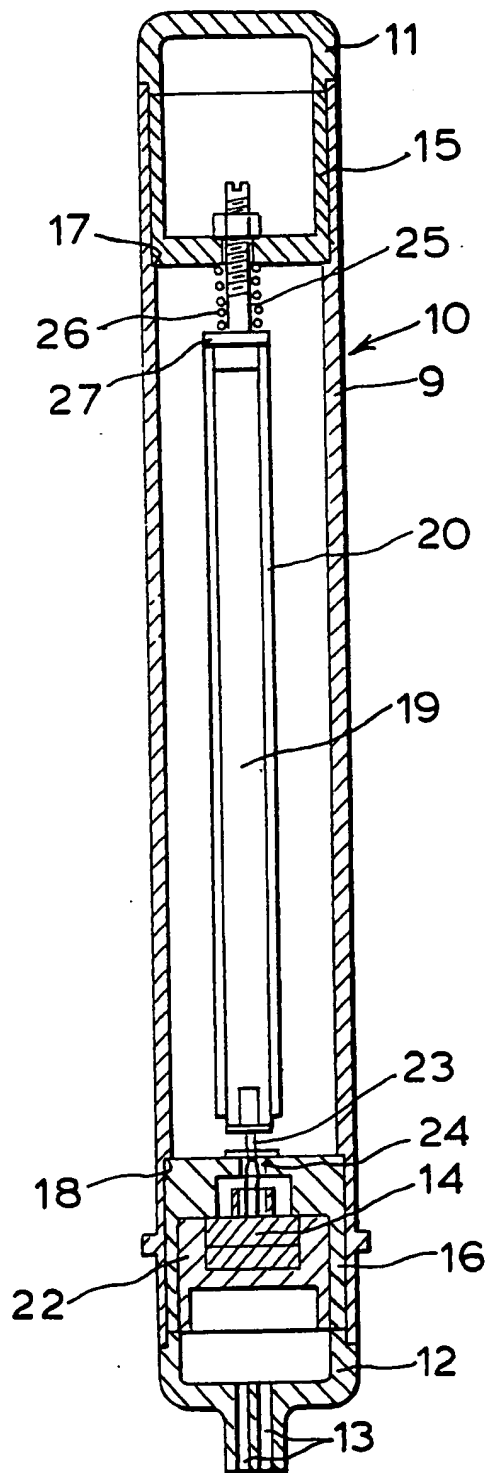
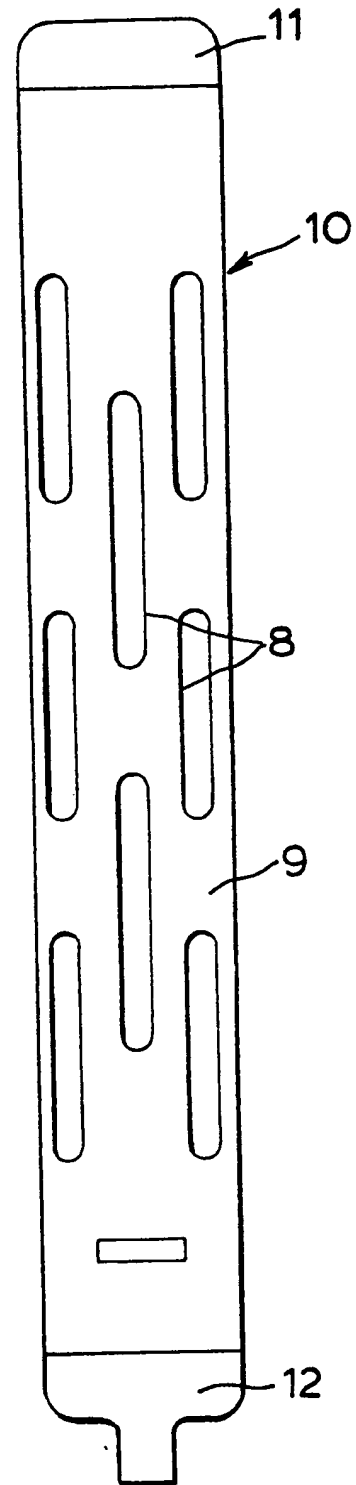


FIG. 2.



SPECIFICATION

Humidity sensor

5 This invention relates to a humidity sensor.

There is a need for a humidity sensor which has no driven parts and which can be used for example to detect an increase in humidity resulting say from the failure of a seal of a sealed enclosure such as of the

10 type containing electronic equipment and which can be used to initialise a warning device.

According to the present invention there is provided a humidity sensor comprising an elongate wooden sensing element in which the grain in the

15 wood extends transverse to the longitudinal extent of the sensing element, an air permeable reinforcing member closely surrounding the sensing element, means mounting the sensing element for longitudinal expansion and/or contraction and permitting

20 exposure of the sensing element to the atmosphere external to the sensor and switch means operable in response to longitudinal expansion or contraction of the sensing element.

Preferred and/or optional features of the invention

25 are set forth in claims 2 - 8.

The invention also provides a sensor as set forth above in combination with a warning device operable by the switch means of the sensor.

The invention will now be more particularly described with reference to the accompanying drawings, in which:

Figure 1 is a vertical section through one embodiment of a humidity sensor according to the present invention, and

35 *Figure 2* is a view of the housing of the sensor of *Figure 1*.

Referring to the drawings, the humidity sensor shown therein comprises a plastics housing 10 consisting of an open ended tubular body 9 provided

40 with a plurality of openings 8 having two snap fittable plastics end caps 11 and 12. The end cap 11 is closed and the lower end cap 12 has two passages 13 through which wires can enter the housing for connection to a switch 14 to be described in more

45 detail later.

Plastics plugs 15 and 16 are accommodated in the housing 10 at opposite ends thereof. The plugs 15 and 16 are a push fit in the housing and engage against annular shoulders 17 and 18 respectively

50 formed in the internal wall of the housing 10.

The sensor also comprises an elongate sensing element 19. The sensing element 19 is formed of wood, preferably soft wood, and its grain is arranged to extend transverse and preferably perpendicular or

55 substantially perpendicular to the longitudinal extent of the sensing element. With its grain arranged in this direction the sensing element 19 will expand considerably more and has been found as much as five times more than a sensing element in which the

60 grain extends in a direction parallel to the longitudinal extent of the sensing element. Moreover, grade 1 yellow or white pine has been found to be particularly suitable as the material of the sensing element because of its lack of significant warping.

65 The sensing element 19 is closely surrounded by a

perforated reinforcing sleeve 20 in non-ferrous metal to support the sensing element 19 against bending and breaking. The fit between the element 19 and sleeve 20 is such as to allow the element 19 to be slid

70 into the sleeve 20.

The switch 14 is a sealed modular press operated diaphragm on/off electrical switch and is mounted in a plastics switch casing 22 push fitted into the lower plug 16 for operation by a switch activator 23

75 secured to the lower end of the sensing element 19 and guided for longitudinal movement by a bush 24 fitted in an aperture in the plastics plug 16.

The upper end (as viewed in *Figure 1*) of the perforated sleeve 20 is rigidly attached to an externally threaded spigot 25 which projects through an aperture in the plug 15. A stainless steel compression spring 26 surrounds the spigot 25 and is interposed between a flange 27 of the spigot and the underside of the plug 15. A threaded nut 28 mates

80 with the free end of the spigot 25 and is adjusted to set the initial position of the sensing element in relation to the switch 21 and then locked in position by any suitable means such as by an appropriate adhesive.

90 In operation, the humidity sensor is installed in an enclosure in which humidity control is important so as to protect for example electronic equipment and the switch 21 is connected to a warning device which may be either optical or audible or even both. The

95 activator 23 is spaced by a preset distance from a pressure operated contact of the switch 21. If the humidity in the enclosure increases the sensing element 19 will expand and if this expansion extends the length of the sensing element 19 beyond a

100 predetermined value the activator 23 will operate the switch 21 to close the circuit of the warning device.

The spring 26 will compress to take up excessive expansion of the sensing element 19 which could otherwise damage the switch 21 and indeed if

105 desired a further switch could be provided at the upper end of the housing 10 to operate a further warning device should such excessive expansion of the sensing element 10 occur.

It will be appreciated, therefore, that in the above

110 arrangement the sensing element is normally under no stress.

The humidity sensor could also be arranged to give an indication of a reducing humidity level. This could be done by using a switch which acts to open a

115 circuit when pressure is applied to it and by setting the sensing element so that at acceptable humidity levels the activator presses on the switch contact.

CLAIMS

120 1. A humidity sensor comprising an elongate wooden sensing element in which the grain in the wood extends transverse to the longitudinal extent of the sensing element, an air permeable reinforcing member closely surrounding the sensing element, means mounting the sensing element for longitudinal

125 expansion and/or contraction and permitting exposure of the sensing element to the atmosphere external to the sensor and switch means operable in response to longitudinal expansion or contraction of

130

the sensing element.

2. The sensor of claim 1, wherein the mounting means for the sensing element comprises a housing provided with openings.

5 3. The sensor of claim 2, wherein the switch means is accommodated in the housing.

4. The sensor of any one of the preceding claims, provided with means whereby the initial position of the sensing element can be set relative to the switch means.

10 5. The sensor of any one of the preceding claims wherein the switch means is operable in response to expansion of the sensing element to a length above a predetermined value.

15 6. The sensor of any one of the preceding claims, wherein the sensing element is of soft wood.

7. The sensor of claim 6, wherein the sensing element is of yellow or white pine.

20 8. The sensor of any one of the preceding claims, wherein the reinforcing member is a perforated non-ferrous metal sleeve.

9. A humidity sensor substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

25 10. The sensor of any one of the preceding claims in combination with a warning device operable by the switch means of the sensor.

Superseded claims 1 - 10

30 New or amended claims:-

1. A humidity sensor comprising an elongate wooden sensing element of yellow or white pine in which the grain in the wood extends transverse to the longitudinal extent of the sensing element, an air permeable reinforcing member closely surrounding the sensing element, means mounting the sensing element for longitudinal expansion and/or contraction and permitting exposure of the sensing element to the atmosphere external to the sensor, and switch means operable in response to longitudinal expansion or contraction of the sensing element.

35 2. The sensor of claim 1, wherein the mounting means for the sensing element comprises a housing provided with openings.

40 3. The sensor of claim 2, wherein the switch means is accommodated in the housing.

45 4. The sensor of any one of the preceding claims, provided with means whereby the initial position of the sensing element can be set relative to the switch means.

50 5. The sensor of any one of the preceding claims wherein the switch means is operable in response to expansion of the sensing element to a length above a predetermined value.

55 6. The sensor of any one of the preceding claims, wherein the reinforcing member is a perforated non-ferrous metal sleeve.

60 7. A humidity sensor substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

8. The sensor of any one of the preceding claims in combination with a warning device operable by the switch means to the sensor.

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